CLAIMS

1. A radio transmission apparatus comprising:

a phase rotator which rotates a phase of a modulation symbol and maps a signal point of the modulation symbol at a signal point of an M-ary modulation level higher by two ranks or more; and

a plurality of interleavers that performs interleaving processing a plurality of times on an I component and/or a Q component of the modulation symbol with the phase rotated.

2. A radio transmission apparatus comprising:

a modulator that maps transmission data on a modulation symbol comprised of an I component and a Q component;

a phase rotator which rotates a phase of the modulation symbol by a predetermined angle and maps a signal point of the modulation symbol at a signal point of an M-ary modulation level higher by two ranks;

a first IQ separator that separates the modulation symbol with the phase rotated to the I component and the Q component with reference to an IQ axis rotated a predetermined angle;

a first interleaver that interleaves the I component and/or the Q component separated in the first IQ separator;

a first IQ combiner that combines the I component and the Q component output from the first interleaver;

a second IQ separator that separates the modulation symbol obtained in the first IQ combiner into the I component and the Q component;

a second interleaver that interleaves the I component and/or the Q component separated in the second IQ separator;

a second IQ combiner that combines the I component and the Q component output from the second interleaver; and

a transmitter that transmits the symbol obtained in the second IQ combiner.

3. The radio transmission apparatus according to claim 2, wherein the modulator performs QPSK modulation, the phase rotator rotates the phase by 26.6°+14.0°, and the first IQ separator separates into the I component and the Q component with reference to the IQ axis inclined 14.0°.

4. The radio transmission apparatus according to claim 2, wherein the modulator performs BPSK modulation, the phase rotator rotates the phase by 45.0°+26.6°, and the first IQ separator separates into the I component and the Q component with reference to the IQ axis inclined 26.6°.

5. The radio transmission apparatus according to claim

2, wherein the transmitter maps the symbol obtained in the second IQ combiner to one of a plurality of subcarriers orthogonal to each other, and thereby modulates each of the subcarriers with the symbol mapped to transmit.

6. A radio transmission apparatus comprising:

a modulator that maps transmission data on a modulation symbol comprised of an I component and a Q component;

a first phase rotator that rotates a phase of the modulation symbol by a predetermined angle and maps a signal point of the modulation symbol at a signal point of a one-rank higher M-ary modulation level;

a first IQ separator that separates the modulation symbol with the phase rotated to the I component and the Q component;

a first interleaver that interleaves the I component and/or the Q component separated in the first IQ separator;

a first IQ combiner that combines the I component and the Q component output from the first interleaver;

a second phase rotator which rotates a phase of the modulation symbol obtained in the first IQ combiner by a predetermined angle and maps a signal point of the modulation symbol at a signal point of a one-rank higher M-ary modulation level;

a second IQ separator that separates the modulation symbol with the phase rotated into the I component and

the Q component;

a second interleaver that interleaves the I component and/or the Q component separated in the second IQ separator;

a second IQ combiner that combines the I component and the Q component output from the second interleaver; and

a transmitter that transmits the symbol obtained in the second IQ combiner.

7. The radio transmission apparatus according to claim 6, wherein the modulator performs QPSK modulation, the first phase rotator rotates the phase by 26.6°, and the second phase rotator rotates the phase by 14.0°.

8. The radio transmission apparatus according to claim 6, wherein the modulator performs BPSK modulation, the first phase rotator rotates the phase by 45.0°, and the second phase rotator rotates the phase by 26.6°.

9. The radio transmission apparatus according to claim 6, wherein the transmitter maps the symbol obtained in the second IQ combiner to one of a plurality of subcarriers orthogonal to each other, and thereby modulates each of the subcarriers with the symbol mapped to transmit.

10. A radio reception apparatus comprising:

an IQ separator that separates a received signal into an I component and a Q component;

a deinterleaver that performs deinterleaving processing on the I component and/or the Q component separated;

an IQ combiner that combines deinterleaved components;

a phase rotator that rotates a phase of a symbol combined in the IQ combiner by a predetermined angle;

an LLR combiner that calculates log-likelihood ratio (LLR) for each bit in the symbol with the phase rotated, separates a value of LLR for each bit into an I component and a Q component, performs deinterleaving processing on a value of LLR for each bit of the I component and/or the Q component, and combines values of LLR of the I component and the Q component subjected to deinterleaving; and

a demodulator that demaps a symbol subjected to LLR combining to obtain reception data.

11. A radio transmission method for performing modulation diversity processing on transmission data to transmit, comprising the steps of:

mapping transmission data at a modulation symbol;

rotating a phase of the modulation symbol and maps a signal point of the modulation symbol at a signal point of an M-ary modulation level higher by two ranks or more;

and

performing interleaving processing a plurality of times on an I component and/or a Q component of the modulation symbol with the phase rotated.